The Electronic Structure of the Ag/Cu(100) Surface Alloy Probed by Auger-Photoelectron Coincidence Spectroscopy *	U16B

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A surface alloy is a metal-on-metal system where the adsorbed species is incorporated into only the first atomic layer of the host. Recently, it has been shown that Au/Ni(110), Ag/Cu(100), and Pd/Cu(100) exhibit surface alloying. The first two of these are particularly interesting as they are immiscible in the bulk. Theoretical studies suggest that the electronic structure of both the host and impurity metals differ significantly and systematically from that of the pure bulk metals. However, the surface alloy phase usually forms at very low impurity concentrations ($\tilde{}$few % monolayer) so investigating these changes with conventional photoelectron spectroscopy is very difficult. We have studied the Ag/Cu(100) surface alloy system using Auger-photoelectron coincidence spectroscopy. Fig. 1 shows the Ag $M_5\,VV$ Auger spectrum obtained in coincidence with the Ag $3d_{5/2}$ core level as a function of Ag coverage on the Cu(100) surface. The detailed line shape of this transition is discussed in an accompanying abstract. The spectra from the thickest films are consistent with that from single crystal Ag. As one enters the monolayer thickness regime, the spectral weight of this CVV Auger transition is shifted to lower kinetic energy. This is consistent with the centroid of the Ag d-levels moving to deeper binding energy, as has been predicted by first principles calculations. Furthermore, there appears to be a slight shift back towards the thick film peak energy for the lowest coverages. This is also consistent with theoretical predictions that d-level shifts in the impurity component are greater in the full monolayer coverage than in the dilute alloy regime. Similar shifts are predicted in the $4d$ levels of Pd in the Pd/Cu(100) system. Measurements to investigate this system are currently underway.

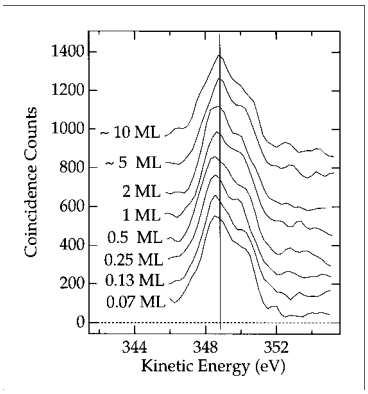

Figure 1. Coincidence Ag $M_5\,VV$ Auger spectra obtained for different coverages of Ag on Cu(100). The shift in the energy of the Auger spectrum is in the correct direction but of a much smaller magnitude than predicted by first principles theory.

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